Litton BIONETICS

P30

MUTAGENICITY EVALUATION
OF
FDA 75-78
THIAMINE HCT USP-FCC
000067-03-8

5516 Nicholson Lane
Kensington, Maryland
20795

Mutagenic Evaluation of Compound FDA 75-78
Final Report 5/77

**Thiamine HCT USP-FCC**

P30

# MUTAGENICITY EVALUATION
# OF

FDA 75-78
THIAMINE HCT USP-FCC
000067-03-8

FINAL REPORT

SUBMITTED TO

DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
FOOD AND DRUG ADMINISTRATION
NEGOTIATED CONTRACTS BRANCH
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SUBMITTED BY

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LBI PROJECT NO. 2672

MAY, 1977

BIONETICS

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## EVALUATION SUMMARY

The test compound, FDA 75-78, 000067-03-8, did not exhibit mutagenic activity in any of the assays employed in these studies.

DATE: May 10, 1977

SPONSOR: U.S. Food and Drug Administration

SUBJECT: Evaluation of Test Compound FDA 75-78 Thiamine HCl USP-FCC 000067-03-8

## I. OBJECTIVE

The objective of this study was to evaluate the test compound for genetic activity in microbial assays with and without the addition of mammalian metabolic activation preparations.

## II. MATERIALS

### A. Test Compound

1. Date Received: October 29, 1976

2. Description: White powder

### B. Indicator Microorganisms

The following strains of indicator microorganisms were used in the evaluation:

Yeast Strain: *Saccharomyces cerevisiae*, strain D4

Bacteria Strains: *Salmonella typhimurium*, strains TA-1535
TA-1537
TA-1538
TA-98
TA-100

### C. Reaction Mixture

The following reaction mixture was employed in the activation tests:

| Component | Final Concentration/ml |
|---|---|
| 1. TPN (sodium salt) | 4 µmoles |
| 2. Glucose-6-phosphate | 5 µmoles |
| 3. Sodium phosphate (dibasic) | 100 µmoles |
| 4. $MgCl_2$ | 8 µmoles |
| 5. KCl | 33 µmoles |
| 6. Homogenate fraction equivalent to 25 mg of wet tissue. | |

D. Tissue Homogenates and Supernatants

The tissue homogenates and 9,000 x g supernatants were prepared from tissues of the following mammalian species: Mouse - ICR random bred adult males; rat - Sprague-Dawley adult males; and monkey - Macaca mulatta adult males.

E. Positive Control Compounds

Table 1 lists chemicals for positive controls in the direct and activation assays.

TABLE 1

POSITIVE CONTROLS USED IN DIRECT AND ACTIVATION ASSAYS

| Assay | Chemical[a] | Solvent | Probable Mutagenic Specificity |
|---|---|---|---|
| Nonactivation | Methylnitrosoguanidine | Water or saline | BPS[b] |
| | Ethylmethanesulfonate | Water or saline | BPS[b] |
| | 2-Nitrofluorene | Dimethylsulfoxide[c] | FS[b] |
| | Quinacrine mustard | Water or saline | FS[b] |
| Activation | Dimethylnitrosamine | Water or saline | BPS[b] |
| | 2-Acetylaminofluorene | Dimethylsulfoxide[c] | FS[b] |
| | 8-Aminoquinoline | Dimethylsulfoxide[c] | FS[b] |
| | 2-Aminoanthracene | Dimethylsulfoxide[c] | BPS[b] |

[a] Concentrations given in the Results Section
[b] BPS = base-pair substitution; FS = frameshift
[c] Previously shown to be non-mutagenic

III. METHODS

A. Toxicity

The solubility, toxicity and doses for the test chemical were determined prior to screening.

The test chemical was tested for toxicity against specific indicator strains over a range of doses to determine the 50% survival dose. Bacteria were tested in phosphate buffer, pH 7.4, for one hour at 37°C on a shaker. Yeasts were tested in phosphate buffer, pH 7.4, for four hours at 30°C on a shaker. The 50% survival concentrations and the 1/4 and 1/2 50% doses calculated.

If no toxicity was obtained for the chemical with a given strain, then a maximum dose of 5% (w/v) was used.

Unless otherwise specified, the doses calculated for the tests in buffer were applied to the activation tests. The solubility of the test chemical under treatment conditions is stated in the Results Section.

B. Plate Tests (Overlay Method)

Approximately $10^8$ cells from an overnight culture of each indicator strain were added to test tubes containing 2.0 ml of molten agar supplemented with biotin and a trace of histidine. For nonactivation tests, the three dose levels of the test compound were added to the contents of the appropriate tubes and poured over the surfaces of selective agar plates. In activation tests 0.5 ml of a 9,000 x g tissue supernatant and required cofactors (core reaction mixture) were added to the overlay tubes. Three dose levels of the test chemical were added to the appropriate tubes, which were then mixed and the contents poured over the surface of a minimal agar (selective medium) plate and allowed to solidify. The plates were incubated for 48 to 72 hours at 37°C, and scored for the number of colonies growing on each plate. The concentrations of all chemicals are given in the Results Section. Positive and solvent controls using positive compounds that are active directly and those that require metabolic activation were run with each assay.

C. Suspension Tests

1. Nonactivation

Bacteria and yeast cultures of the indicator organisms were grown in complete broth, washed and resuspended in 0.9% saline to densities of $1 \times 10^{10}$ cells/ml and $5 \times 10^9$ cells/ml, respectively. This constituted the working stock for tests of a group of test chemicals and their respective controls. Tests were conducted in plastic, 24-well tissue culture plates (Linbro). Cells plus appropriate volume(s) of the test chemical were added to the wells to give a final volume of 1.5 ml. The solvent replaced the test chemical in the negative controls. Treatment was at 30°C for four hours for yeast tests and at 37°C for one hour for bacterial tests. All flasks were shaken during treatment. Following treatment, the plates were set on ice. Aliquots of cells were removed, diluted in sterile saline (4°C) and plated on the appropriate complete media. Undiluted samples from flasks containing the bacteria were plated on minimal selective medium in reversion experiments. Samples from a $10^{-1}$ dilution of treated cells were plated on the selected media for enumeration of gene conversion with strain D4. Bacterial plates were scored after incubation for 48 hours at 37°C. The yeast plates were incubated at 30°C for 3-5 days before scoring.

2. Activation

Bacteria and yeast cells were grown and prepared as described in the nonactivation tests. Measured amounts of the test and control chemicals plus 0.25 ml of the stock-cell suspension were added to wells of the Linbro plate containing the appropriate tissue fraction and reaction mixture. All flasks (bacteria and yeast) were incubated at 37°C with shaking. The treatment times as well as the dilutions, plating procedures and scoring of the plates were the same as described for nonactivation tests.

D. Preparation of Tissue Homogenates and 9,000 x g Cell Fractions

Male animals (except monkeys) sufficient to provide the necessary quantities of tissues were killed by cranial blow, decapitated and bled. Monkey tissues were obtained from freshly killed and bled male rhesus monkeys. Organs were immediately dissected from the animals using aseptic techniques and placed in ice-cold 0.15M KCl. Upon collection of the desired quantity of organs, they were washed twice with fresh KCl and completely homogenized with a motor-driven homogenizing unit at 4°C. The whole organ homogenate obtained from this step was divided into two samples. One sample was frozen at -80°C and the other was centrifuged for 20 minutes at 9,000 x g in a refrigerated centrifuge. The supernatant from the centrifuged sample was retained and frozen at -80°C. These two frozen samples were used for the activation studies. Protein and P-448 determinations were made for each lot of homogenate.

E. Data Recording and Reporting

1. Plate test assays

The numbers of colonies on each plate were counted and recorded on printed forms. These raw data were entered into a computer program designed to print out all data by test. The data are presented as revertants per plate for each indicator strain employed in the assay. The positive and solvent controls are provided as reference points.

2. Suspension assays

Following the specified incubation periods all population plates were scored by an automatic colony counter and the results from each plate of a set were recorded, in ink, on data processing forms. All minimal or other types of selective media plates were hand scored and the results recorded along with the respective population data. Other relevant experimental data were recorded on experimental definition forms. For bacteria strains the number of colonies recorded from either the population or selective plates represents that number in 1 ml of test suspension plated. The numbers recorded for the yeast strain D4 represent the number in 0.5 ml of test suspension plated. The data were then processed and printed from a computer program. All raw data sheets are dated and signed by the responsible technician.

IV. RESULTS SECTION

A. Solubility Properties of the Test Compound

1. Name or code designation of the test compound: 000067-03-8
Thiamine HCl USP-FCC
FDA 75-78

2. Test solvent: Saline

3. Solubility of the test compound under treatment conditions: Soluble

4. Additional comments: Clump white powder - chalk like consistency

B. Toxicity and Dosage Determinations for the Test Compound

1. Test date for toxicity determination:

2. The 50% survival level was determined for bacteria and yeast indicator organisms by conducting survival curves with the test compound at the following concentrations:

Percent Concentration (w/v or v/v)

5.0
0.5
0.05
0.005
0.0005

3. Concentrations of the test compound used in the mutagenicity tests:

| | Percent Concentration | |
|---|---|---|
| Test Doses | Bacteria | Yeast |
| 1/4 50% Survival | 0.01825 | 0.002781 |
| 1/2 50% Survival | 0.03650 | 0.05563 |
| 50% Survival | 0.07300 | 0.1113 |

C. Plate Test Results

The plate test results are summarized in the following table. The values presented in this table are the number of revertants per plate.

D. Suspension Assay Results

The suspension test results for the test compound are summarized in the tables following the plate test summary. The values presented in these tables are the calculated mutation frequencies for each control and experimental test point. The first table of the suspension set presents the results for the nonactivation assays, and the second table through the fourth table of the suspension set presents the results for the activation assays. A listing of computer codes and abbreviations is included for reference. Tabulation of all raw data is provided in the Appendix.

SUMMARY OF TEST RESULTS

PLATE TESTS

A. NAME OR CODE DESIGNATION OF THE TEST COMPOUND: 000067038

B. TEST DATE: DEC. 16, 1976

| TEST | | SPECIES | TISSUE | REVERTANTS PER PLATE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | TA-1535 | | TA-1537 | | TA-1538 | | TA-98 | | TA-100 | |
| | | | | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| 1. NON-ACTIVATION | | | | | | | | | | | | | |
| SOLVENT CONTROL* | | --- | --- | 24 | 34 | 17 | 15 | 18 | 21 | 53 | 47 | 122 | 189 |
| POSITIVE CONTROL** | | --- | --- | >1000 | >1000 | >1000 | >1000 | >1000 | >1000 | >1000 | >1000 | >1000 | >1000 |
| TEST | 0.07300 % | --- | --- | 29 | 35 | 18 | 15 | 21 | 14 | 43 | 39 | 132 | 138 |
| | 0.03650 % | --- | --- | 24 | 32 | 14 | 16 | 32 | 12 | 33 | 40 | 145 | 133 |
| | 0.01825 % | --- | --- | 33 | 34 | 17 | 15 | 22 | 19 | 42 | 35 | 120 | 150 |
| 2. ACTIVATION | | | | | | | | | | | | | |
| SOLVENT CONTROL* | | MOUSE | LIVER | 32 | 28 | 25 | 30 | 34 | 32 | 47 | 49 | 160 | 163 |
| | | RAT | LIVER | 38 | 29 | 29 | 34 | 23 | 19 | 38 | 47 | 219 | 195 |
| | | MONKEY | LIVER | 26 | 32 | 18 | 23 | 29 | 40 | 42 | 45 | 176 | 199 |
| POSITIVE CONTROL*** | | MOUSE | LIVER | 793 | 851 | 252 | 297 | >1000 | >1000 | >1000 | >1000 | >1000 | >1000 |
| | | RAT | LIVER | 699 | 590 | 264 | 357 | 719 | 894 | >1000 | >1000 | >1000 | >1000 |
| | | MONKEY | LIVER | 539 | 446 | 155 | 181 | 514 | 525 | >1000 | 940 | >1000 | >1000 |
| TEST | 0.07300 % | MOUSE | LIVER | 23 | 23 | 11 | 10 | 31 | 26 | 29 | 38 | 223 | 202 |
| | 0.03650 % | MOUSE | LIVER | 29 | 22 | 21 | 17 | 19 | 21 | 37 | 39 | 207 | 191 |
| | 0.01825 % | MOUSE | LIVER | 22 | 19 | 21 | 20 | 36 | 35 | 39 | 47 | 173 | 232 |
| | 0.07300 % | RAT | LIVER | 34 | 28 | 13 | 12 | 28 | 36 | 37 | 38 | 196 | 224 |
| | 0.03650 % | RAT | LIVER | 88 | 75 | 14 | 15 | 46 | 38 | 35 | 44 | 182 | 207 |
| | 0.01825 % | RAT | LIVER | 94 | 67 | 19 | 17 | 50 | 35 | 45 | 51 | 206 | 193 |
| | 0.07300 % | MONKEY | LIVER | 34 | 28 | 13 | 25 | 28 | 30 | 41 | 42 | 232 | 259 |
| | 0.03650 % | MONKEY | LIVER | 23 | 29 | 17 | 18 | 25 | 23 | 48 | 59 | 203 | 236 |
| | 0.01825 % | MONKEY | LIVER | 34 | 28 | 19 | 18 | 20 | 20 | 53 | 50 | 217 | 191 |

* NON-ACTIVATION ASSAYS CONSIST OF THE CELLS PLUS THE TEST COMPOUND VEHICLE (SOLVENT). FOR ACTIVATION ASSAYS, THE OVERLAY CONTAINS THE ACTIVATION SYSTEM PLUS THE TEST COMPOUND VEHICLE.

** TA-1535 MNNG 2 UG/PLATE
TA-1537 QM 20 UG/PLATE
TA-1538 NF 100 UG/PLATE
TA-98 NF 100 UG/PLATE
TA-100 MNNG 2 UG/PLATE

*** TA-1535 ANTH 100 UG/PLATE
TA-1537 AMQ 100 UG/PLATE
TA-1538 AAF 100 UG/PLATE
TA-98 AAF 100 UG/PLATE
TA-100 ANTH 100 UG/PLATE

NOTE: CONCENTRATIONS ARE GIVEN IN MICROLITERS(UL) OR MICROGRAMS(UG) PER PLATE.

\- INDICATES NO DATA WAS TAKEN.

LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
REPORT EX834

COMPOUND FREQUENCY SUMMARY REPORT 02/22/77

NONACTIVATION COMPOUND 000067038

| TEST | ORG | TA100 HIS EX-0 | TA100 HIS EX-0 | TA1535 HIS EX-0 | TA1537 HIS EX-0 | TA1538 HIS EX-0 | TA98 HIS EX-0 | 0000D4 ADE EX-5 | 0000D4 TRY EX-5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| NAN | | 93.00 | 92.16 | 10.00 | 24.95 | 10.10 | 3.79 | 19.75 | 5.37 | CONTROLS |
| NAP | | 891.53 | 1267.42 | 481.64 | 178.71 | 195.22 | 141.25 | 101.54 | 67.35 | |
| NA1 | | 35.71 | 85.46 | 5.45 | 20.92 | 10.71 | 3.61 | 10.35 | 5.61 | TEST DATA |
| NA2 | | 19.74 | 68.05 | 5.23 | 14.81 | 10.13 | 2.37 | 11.67 | 8.19 | |
| NA3 | | 36.88 | 92.83 | 7.17 | 14.61 | 10.64 | 2.93 | 7.82 | 5.95 | |

LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
REPORT EXR34

COMPOUND FREQUENCY SUMMARY REPORT 02/22/77

SPECIES ICRFLO/MOUSE COMPOUND 000067038

| TEST | ORG | TA100 HIS EX-8 | TA1535 HIS EX-8 | TA1537 HIS EX-8 | TA1538 HIS EX-8 | TA98 HIS EX-8 | 0000D4 ADE EX-5 | 0000D4 TRY EX-5 | |
|---|---|---|---|---|---|---|---|---|---|
| ACT | A+C | 184.08 | 4.97 | 5.44 | 7.54 | 3.58 | 14.04 | 11.23 | NEGATIVE CONTROLS |
| ACT | A-C | 70.56 | 5.02 | 4.77 | 10.87 | 2.69 | 16.96 | 13.67 | |
| ACT | ALI | 109.86 | 4.39 | 4.68 | 9.73 | 8.14 | 19.69 | 12.92 | |
| ACT | ALU | 78.31 | 4.92 | 5.66 | 10.04 | 5.45 | 20.41 | 15.61 | |
| ACT | PLI | 251.33 | 119.24 | 141.85 | 222.79 | 64.02 | 76.42 | 76.94 | POSITIVE CONTROLS |
| ACT | PLU | 94.27 | 5.17 | 7.13 | 67.40 | 9.73 | 18.36 | 11.01 | |
| ACT | LI1 | 73.51 | 9.98 | 6.65 | 15.30 | 8.30 | 12.94 | 4.85 | TEST COMPOUND |
| ACT | LI2 | 57.52 | 5.13 | 4.91 | 16.96 | 8.15 | 13.33 | 7.67 | |
| ACT | LI3 | 50.50 | 9.01 | 3.49 | 11.68 | 8.29 | 11.46 | 7.99 | |
| ACT | LU1 | 76.11 | 4.41 | 5.57 | 16.85 | 8.03 | 7.73 | 5.23 | |
| ACT | LU2 | 81.30 | 8.60 | 8.37 | 18.75 | 9.77 | 11.72 | 8.98 | |
| ACT | LU3 | 100.00 | 9.48 | 3.70 | 14.47 | 6.38 | 12.78 | 8.08 | |

LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
REPORT EX934

COMPOUND FREQUENCY SUMMARY REPORT 02/22/77

SPECIES SPRDAW/RAT COMPOUND 000067038

| TEST | ORG | TA100 HIS EX-8 | TA1535 HIS EX-8 | TA1537 HIS EX-8 | TA1538 HIS EX-8 | TA98 HIS EX-8 | 0000D4 ADE EX-5 | 0000D4 TRY EX-5 | |
|---|---|---|---|---|---|---|---|---|---|
| ACT | A+C | 161.00 | 7.00 | 3.77 | 46.02 | 2.66 | 13.64 | 10.19 | NEGATIVE CONTROLS |
| ACT | A-C | 128.57 | 7.78 | 1.60 | 9.88 | 6.37 | 16.00 | 11.09 | |
| ACT | AL1 | 128.30 | 2.66 | 2.05 | 13.54 | 22.50 | 18.91 | 9.31 | |
| ACT | ALU | 111.58 | 3.85 | 2.85 | 12.30 | 9.64 | 17.03 | 8.67 | |
| ACT | PLI | 173.97 | 138.63 | 89.01 | 128.54 | 299.56 | 97.06 | 72.40 | POSITIVE CONTROLS |
| ACT | PLU | 112.05 | 4.45 | 8.17 | 32.58 | 49.31 | 10.15 | 3.16 | |
| ACT | LI1 | 99.16 | 8.57 | 3.78 | 12.94 | 9.60 | 14.91 | 6.91 | TEST COMPOUND |
| ACT | LI2 | 85.96 | 5.36 | 2.75 | 13.27 | 10.15 | 14.81 | 9.82 | |
| ACT | LI3 | 104.95 | 3.80 | 5.60 | 16.23 | 10.00 | 9.86 | 5.87 | |
| ACT | LU1 | 105.31 | 5.86 | 3.68 | 15.41 | 10.09 | 12.13 | 7.33 | |
| ACT | LU2 | 100.21 | 4.23 | 2.68 | 14.97 | 9.27 | 12.95 | 11.22 | |
| ACT | LU3 | 95.28 | 2.46 | 2.43 | 17.65 | 11.07 | 12.60 | 10.34 | |

LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
REPORT EXR34

COMPOUND FREQUENCY SUMMARY REPORT 02/22/77

SPECIES RHESUS/MONKEY COMPOUND 000067030

| TEST | ORG | TA100 HIS EX-A | TA1535 HIS EX-A | TA1537 HIS EX-A | TA1538 HIS EX-A | TA98 HIS EX-A | 0000D4 ADE EX-5 | 0000D4 TRY EX-5 | |
|---|---|---|---|---|---|---|---|---|---|
| ACT | A+C | 53.27 | 2.58 | 2.45 | 9.78 | 5.79 | 19.41 | 10.65 | NEGATIVE CONTROLS |
| ACT | A-C | 57.26 | 2.21 | 2.44 | 13.84 | 5.50 | 18.48 | 9.49 | |
| ACT | ALI | 82.47 | 3.39 | 2.07 | 12.29 | 9.56 | 16.49 | 10.91 | |
| ACT | ALU | 72.94 | 2.78 | 1.10 | 11.95 | 10.63 | 15.33 | 10.17 | |
| ACT | PLI | 195.14 | 36.71 | 81.50 | 137.05 | 123.31 | 93.48 | 73.43 | POSITIVE CONTROLS |
| ACT | PLU | 101.96 | 2.37 | 4.66 | 15.42 | 17.43 | 25.84 | 17.05 | |
| ACT | LI1 | 128.57 | 1.75 | 1.52 | 13.85 | 11.75 | 16.60 | 9.87 | TEST COMPOUND |
| ACT | LI2 | 101.33 | 2.92 | 1.42 | 11.26 | 11.90 | 13.95 | 10.53 | |
| ACT | LI3 | 72.41 | 2.80 | 1.81 | 15.01 | 13.14 | 21.43 | 9.74 | |
| ACT | LU1 | 58.98 | 2.40 | 1.84 | 12.26 | 7.33 | 16.91 | 13.38 | |
| ACT | LU2 | 41.01 | 2.02 | 2.13 | 15.03 | 10.20 | 23.64 | 11.50 | |
| ACT | LU3 | 142.45 | 2.20 | 1.52 | 12.70 | 9.52 | 20.53 | 10.02 | |

## DATA TABLE TERMS AND ABBREVIATIONS

| ABBREVIATION OR TERM | DEFINITION OR EXPLANATION |
|---|---|
| COMPOUND | Client designated compound number appears in this column. |
| TEST CODES | NAN = Nonactivation: Solvent Control<br>NAP = Nonactivation: Positive Control<br>NA1 = Nonactivation: Test Compound Dose 1<br>NA2, etc. = Reflects the other dose level(s)<br><br>A+C = Negative Chemical Control for ACP<br>A-C = Activation: Solvent Control<br>ALI or A+T = Activation: Homogenate Control (Liver)<br>ALU = Activation: Homogenate Control (Lung)<br>ACP = Activation: Positive Control<br>ACT = Activation Test<br><br>LI = Liver Tissue Activation Fraction<br>LU = Lung Tissue Activation Fraction<br>KI = Kidney Tissue Activation Fraction<br>TE = Testes Tissue Activation Fraction<br>1,2, etc. = Dose Levels |
| CONCENTRATION | All test compound dose levels are expressed as a whole number followed by an exponent (negative) identified by the appropriate units.<br><br>Example: 0025-2PCT = 0.25 percent concentration |
| POPU | Total number of viable cells in the plating sample raised to some exponent printed directly below the abbreviation (i.e., EP + 6 = x $10^6$). |
| MUT 1 | Total number of mutants or convertants obtained from the sample plated raised to some exponent printed directly below the abbreviation (i.e., EP + 0 = $10^0$). For strain D4, MUT 1 represents the number of ADE+ convertants. |
| MUT 2 | Only used for strain D4 and represents the number of TRY+ convertants in the plated sample. |
| FREQ 1 | The calculated mutation or gene conversion frequency times the negative exponent written directly below. For strain D4, FREQ 1 represents the ADE+ value. |
| FREQ 2 | Only used for strain D4 and represents the TRY+ conversion frequency. |
| CONTAM | Presence of contamination on any plates. |

DATA TABLE TERMS AND ABBREVIATIONS (continued)

| ABBREVIATION OR TERM | DEFINITION OR EXPLANATION |
|---|---|
| AAF | 2-Acetylaminofluorene |
| DMSO | Dimethylsulfoxide |
| DMN | Dimethylnitrosamine |
| EMS | Ethylmethanesulfonate |
| QM | Quinacrine Mustard |
| NF | Nitrofluorene |
| ANTH | 2-Amino Anthracene |
| AMQ | 8-Amino Quinoline |
| SPECIES | Animal Strains |
| SPRDAW | Sprague Dawley Rats |
| ICRFLO | Flow ICR Random Bred Mice |
| RHESUS | Rhesus Monkey (Macaca mulatta) |
| MIXEDB | Dog, Mixed Breed |
| NEWZEA | New Zealand White Rabbit |
| UG | Microgram |
| UM | Micromole |
| ADE | Adenine |
| TRY | Tryptophan |

V. INTERPRETATION OF RESULTS AND CONCLUSIONS

The test compound, FDA 75-78, 000067-03-8, was evaluated for genetic activity in a series of *in vitro* microbial assays with and without metabolic activation. The following results were obtained:

A. *Salmonella typhimurium*

1. Plate tests

The results of these tests were negative.

2. Nonactivation suspension tests

The results of these tests were negative. The test with TA-100 was repeated because of the high population counts at the NA1 and NA2 doses in the initial test.

3. Activation suspension tests

The results of these tests were negative.

B. *Saccharomyces cerevisiae*

1. Nonactivation suspension tests

The results of these tests were negative.

2. Activation suspension tests

The results of these tests were negative.

C. Conclusions

The test compound, FDA 75-78, 000067-03-8, did not exhibit mutagenic activity in any of the assays employed in these studies.

Submitted by:

David J. Brusick, Ph.D. — Date 5/11/77
Director
Department of Genetics

Reviewed by:

Robert J. Weir, Ph.D. — Date 5/11/77
Vice President

## VI. EXPLANATION OF EVALUATION PROCEDURES FOR PLATE ASSAYS

Plate test data consist of direct revertant colony counts obtained from a set of selective agar plates seeded with populations of mutant cells suspended in a semisolid overlay. Because the test chemical and cells are incubated in the overlay for 2-3 days, and a few cell divisions occur during the incubation period, the test is semiquantitative in nature. Although these features of the assay reduce the quantitation of results, they provide certain advantages not contained in a quantitative suspension test.

- The small number of cell divisions permits potential mutagens to act on replicating DNA which is often more sensitive than non-replicating DNA.
- The combined incubation of the compound and the cells in the overlay permit constant exposure of the indicator cells for 2-3 days.

### A. Surviving Populations

Plate test procedures do not permit exact quantitation of the number of cells surviving chemical treatment. At low concentrations of the test chemical, the surviving population on the treatment plates is essentially the same as the negative control plate. At high concentrations, the surviving population is usually reduced by some fraction. Our protocol normally employs dose levels that are selected such that the highest dose will show slight toxicity (as determined by subjective criteria) and several doses ranging down 1 to 2 logs lower.

### B. Dose Response Phenomena

The demonstration of dose-related increases in mutant counts is an important criterion in establishing mutagenicity. Factors which may modify dose response results for a mutagen would be the selection of doses that are too low (usually mutagenicity and toxicity are related). If the highest dose is far lower than a toxic concentration, no increases may be observed over the dose range selected. Conversely, if the lowest dose employed is highly cytotoxic, the test chemical may kill any mutants that are induced and the compound will not appear to be mutagenic.

### C. Control Tests

Positive and negative control assays are conducted with each experiment and consist of direct acting mutagens for nonactivation assays and mutagens that require metabolic biotransformation in activation assays. Negative controls consist of the test compound solvent in the overlay agar with the other essential components. The negative control plate for each strain gives a reference point to which the test data are compared. The positive control assay is conducted to demonstrate that the test systems are functional with known mutagens.

D. Evaluation Criteria for Ames Assay

Because the procedures used to evaluate the mutagenicity of the test chemical are semiquantitative, the criteria used to determine positive effects are inherently subjective and are based primarily on a historical data base. Most data sets are evaluated using the following criteria:

1. Strains TA-1535, TA-1537, and TA-1538

If the solvent control value is within the normal range, a chemical that produces a positive dose response over three concentrations with the lowest increase equal to twice the solvent control value is considered to be mutagenic.

2. Strains TA-98, TA-100, and D4

If the solvent control value is within the normal range, a chemical that produces a positive dose response over three concentrations with the highest increase equal to twice the solvent control value for TA-100 and two to three times the solvent control value for strains TA-98 and D4 is considered to be mutagenic. For these strains, the dose response increase should start at approximately the solvent control value.

3. Pattern

Because TA-1535 and TA-100 were both derived from the same parental strain (G-46) and because TA-1538 and TA-98 were both derived from the same parental strain (D3052), there is a built-in redundancy in the microbial assay. In general the two strains of a set respond to the same mutagen and such a pattern is sought. It is also anticipated that if a given strain, e.g. TA-1537, responds to a mutagen in nonactivation tests it will generally do so in activation tests. (The converse of this relationship is not expected.) While similar response patterns are not required for all mutagens, they can be used to enhance the reliability of an evaluation decision.

4. Reproducibility

If a chemical produces a response in a single test that cannot be reproduced in one or more additional runs, the initial positive test data loses significance.

The preceding criteria are not absolute and other extenuating factors may enter into a final evaluation decision. However, these criteria are applied to the majority of situations and are presented to aid those individuals not familiar with this procedure. As the data base is increased, the criteria for evaluation can be more firmly established.

## VII. EXPLANATION OF EVALUATION PROCEDURES FOR SUSPENSION ASSAYS

Data obtained from mutagenicity tests are evaluated on a test by test basis followed by an examination of the total response pattern using all the data. To facilitate this type of evaluation, we have prepared two separate formats in which data are processed. The first is the Compound Summary Backup Detail Sheet, which details the essential raw data from each experiment showing surviving population counts, total mutant or convertant counts, as well as, calculated mutation frequencies. This format permits close examination of each set of test data. The following considerations are part of any assessment.

### A. Surviving Population Counts

A certain level of chemically-induced toxicity is anticipated, but occasionally isolated tests or groups of tests show very low (<25%) survival compared to the tissue controls. Such isolated decreases may result from improper dilution procedures or defective growth media and decrease confidence in the calculated mutation frequencies especially if the total mutant counts appear unaffected. Data of this type are generally unacceptable and these experiments are routinely repeated at a lower dose level to reduce killing and increase confidence in the nature of the response.

### B. Total Mutant Counts

For nonmutagens, the mutant/surviving population ratio should be roughly equivalent for each test point in a given experiment. If the cell number drops in response to killing, the mutant number should decrease proportionately. A mutagenic chemical, however, will produce an altered mutant/surviving population ratio. Mutant numbers as well as calculated frequencies are compared to the negative control data. In certain instances, the mutant frequencies will increase with little or no change in the absolute number of mutants especially where the test chemical is toxic. Data of this type, although not necessarily aberrant, or even rare, must be viewed with special care to ensure that the increased frequencies were not the result of selective toxicity of the test chemical for the his⁻ cells. This phenomenon, referred to as selection, can lead to erroneous conclusions. Thus we attempt to keep the surviving population of cells high and look for positive responses that show increases in both numbers of mutants and mutation frequencies. Again, occasional isolated fluctuations in mutant counts are found that can be attributed to improper pipetting or media contamination. These fluctuations are usually easy to identify by inspection of the other data points in the experiment which will be negative.

C. Dose Response Phenomena

Dose-related increases in mutants and mutation frequencies are the most convincing data to have in assessing mutagenic activity of chemicals. In some cases, however, dose-related increases are not observed for mutagens. This depends considerably on the dose levels selected. The figure on the following page illustrates how one might obtain various types of dose-related responses by a mutagen based solely on dose selection. It also emphasizes the need to keep dose levels within a relatively low range of toxicity so that data are consistently on the uphill side of the hypothetical curve.

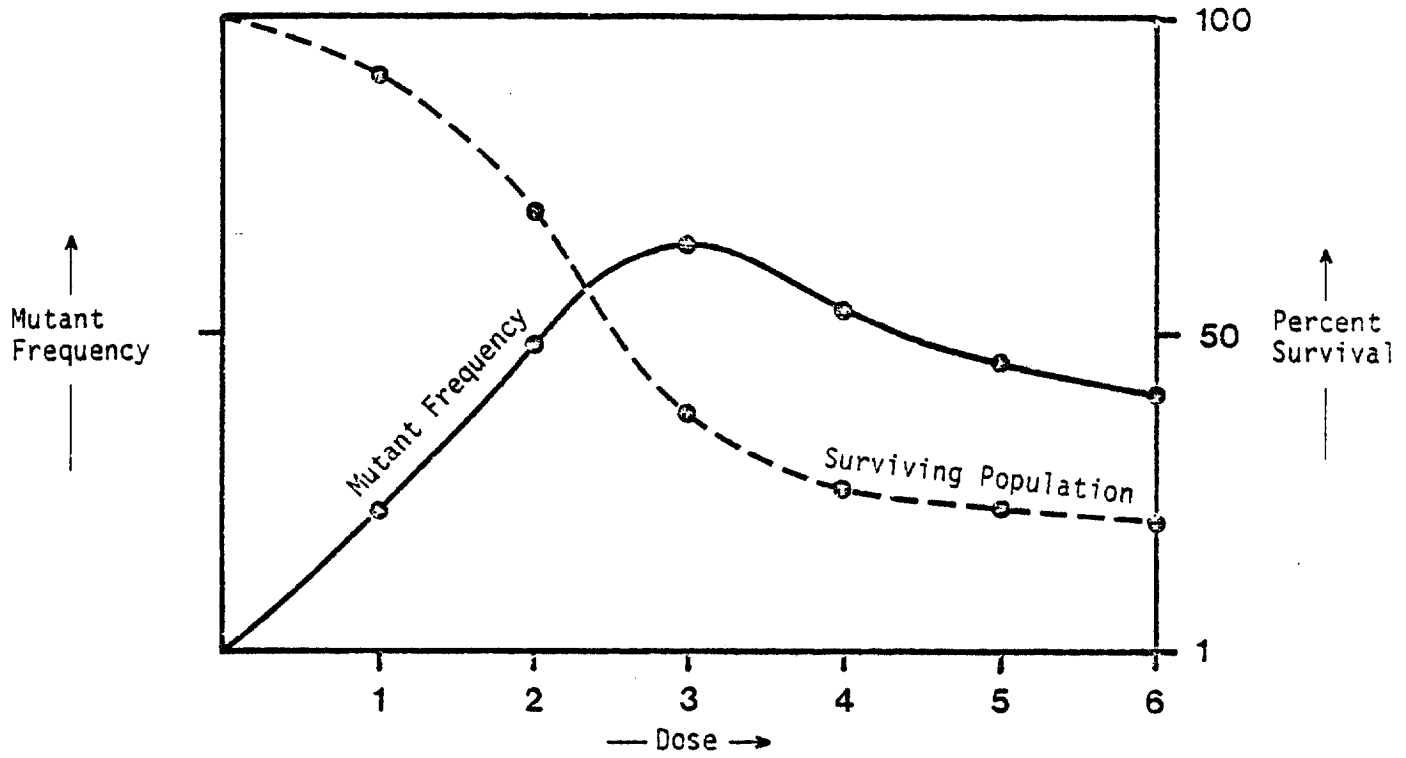
D. Control Tests

Positive and negative control tests are conducted with each experiment and consist of direct acting positive agents for nonactivation assays and chemicals that require metabolic transformation for activation assays. In nonactivation assays, the NAN control contain the test chemical solvent plus cells, but no chemical, and is used as a reference to assess the level of response obtained in the various tests. It is not possible at this time to put precise cut-off points where negative responses become positive responses. A statistical component for our computer program is under development and will be included when available. Positive controls are only used as relative reference points and to demonstrate that the system is functioning with known mutagens. In activation assays, three types of negative controls are run: (1) A solvent control minus the chemical and minus the activation system (A-C); (2) a control plus the positive control chemical minus the activation system (A+C); and (3) a control containing the activation system and the test chemical solvent (ALI or ALU). All three controls are used collectively to assess the level of response in the various activation tests. A chemical may appear positive when compared to an A-C control but not when compared to an A+T control. The value of each of the above controls with respect to their weight in evaluation is ALI or ALU > A-C > A+C.

The other data format is the Compound Frequency Summary Report sheet in which all the calculated frequencies obtained for a given compound are displayed in a table. This format permits an overview of all data. The points form a matrix of information that should present a consistent pattern. Nonmutagens should produce a matrix with data frequencies clustered around the negative control values. Occasional random high or low fluctuations are not uncommon and seldom indicate true genetic activity. Mutagenic chemicals should, on the other hand, produce a set of consistent responses that demonstrate a logical pattern. The patterns depend on the mutagenic specificity of the chemical but can be easily recognized in the Compound Frequency Summary Report format.

These mutagenicity assays are designed to optimize the probability of recognizing mutagens from nonmutagens and, in most cases, they work well. Occasionally, the data points are such that a definitive conclusion cannot be made without additional data.

. HYPOTHETICAL MUTATION AND TOXICITY KINETICS




| HYPOTHETICAL EXPERIMENT | OBSERVED DOSE RESPONSE |
|---|---|
| (1) Dose levels 1,2 & 3 were used | A typical positive dose response set of data would be obtained. |
| (2) Dose levels 2, 3 & 4 were used | The intermediate dose level shows a higher mutation frequency than both the low dose and the high dose. |
| (3) Dose levels 3, 4 & 5 were used | Here an inverted dose response would be observed with the highest dose level showing the lowest response. |

# APPENDIX

## Tabulation of Data

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22376-2102 PROJECT 02672
EXPERIMENT 704502 DETECTOR TA100 SPECIES / DATE - 02/24/77

| COMPOUND | TEST | OPG ID | CONCENTRATION | POPU EP+6 | MUTI EP+0 | FREQI EP-8 | CONTAM |
|---|---|---|---|---|---|---|---|
| | NAN | | SOLVENT | 0408 | 0376 | 92.16 | 0 |
| | NAP | | EMS 0.066% | 0353 | 4474 | 1267.42 | 0 |
| 000067038 | NA1 | | 0073-3 PCT. | 0227 | 0194 | 85.46 | 0 |
| 000067038 | NA2 | | 0365-4 PCT. | 0457 | 0311 | 68.05 | 0 |
| 000067038 | NA3 | | 1825-5 PCT. | 0516 | 0479 | 92.83 | 0 |

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22376-2102 PROJECT 02672
EXPERIMENT 633401 DETECTOR TA100 SPECIES / DATE - 02/24/77

| COMPOUND | TEST | ORG ID | CONCENTRATION | POPU EP+6 | MUTI EP+0 | FREQ1 EP-8 | CONTAM |
|---|---|---|---|---|---|---|---|
| | NAN | | SOLVENT | 0514 | 0478 | 93.00 | 0 |
| | NAP | | EMS 0.066% | 0744 | 6633 | 891.53 | 0 |
| 000067038 | NA1 | | 0073-3 PCT. | 1109 | 0396 | 35.71 | 0 |
| 000067038 | NA2 | | 0365-4 PCT. | 2346 | 0463 | 19.74 | 0 |
| 000067038 | NA3 | | 1825-5 PCT. | 0987 | 0364 | 36.88 | 0 |

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22376-2102 PROJECT 02672
EXPERIMENT 633702 DETECTOR TA1535 SPECIES / DATE - 02/24/77

| COMPOUND | TEST | ORG ID | CONCENTRATION | POPU EP+6 | MUTI EP+0 | FREQ1 EP-8 | CONTAM |
|---|---|---|---|---|---|---|---|
| | NAN | | SOLVENT | 0480 | 0048 | 10.00 | 0 |
| | NAP | | EMS 0.2% | 0828 | 3988 | 481.64 | 0 |
| 00006703A | NA1 | | 0073-3 PCT. | 0808 | 0044 | 5.45 | 0 |
| 00006703A | NA2 | | 0365-4 PCT. | 0841 | 0044 | 5.23 | 0 |
| 00006703A | NA3 | | 1825-5 PCT. | 0753 | 0054 | 7.17 | 0 |

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22376-2102 PROJECT 02672
EXPERIMENT 633406 DETECTOR TA1537 SPECIES / DATE - 02/24/77

| COMPOUND | TEST | ORG ID | CONCENTRATION | POPU EP+6 | MUTI EP+0 | FREQI EP-8 | CONTAM |
|---|---|---|---|---|---|---|---|
| | NAN | | SOLVENT | 1038 | 0259 | 24.95 | 0 |
| | NAP | | QM 13 UG/ML | 0681 | 1217 | 178.71 | 0 |
| 000067038 | NA1 | | 0073-3 PCT. | 0741 | 0155 | 20.92 | 0 |
| 000067038 | NA2 | | 0365-4 PCT. | 1134 | 0168 | 14.81 | 0 |
| 000067038 | NA3 | | 1825-5 PCT. | 1102 | 0161 | 14.61 | 0 |

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22376-2102 PROJECT 02672
EXPERIMENT 633703 DETECTOR TA1538 SPECIES / DATE - 02/24/77

| COMPOUND | TEST | OPG ID | CONCENTRATION | POPU EP+6 | MUTI EP+8 | FREQI EP-8 | CONTAM |
|---|---|---|---|---|---|---|---|
| | NAN | | SOLVENT | 0485 | 0049 | 10.10 | 0 |
| | NAP | | NF 667 UG/ML | 0418 | 0816 | 195.22 | 0 |
| 000067038 | NA1 | | 0073-3 PCT. | 0551 | 0059 | 10.71 | 0 |
| 000067038 | NA2 | | 0365-4 PCT. | 0474 | 0048 | 10.13 | 0 |
| 000067038 | NA3 | | 1825-5 PCT. | 0451 | 0048 | 10.64 | 0 |

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22376-2102 PROJECT 02672
EXPERIMENT 634120 DETECTOR TA98 SPECIES / DATE - 02/24/77

| COMPOUND | TEST | ORG ID | CONCENTRATION | POPU EP+6 | MUTI EP+0 | FREQI EP-8 | CONTAM |
|---|---|---|---|---|---|---|---|
| | NAN | | SOLVENT | 1397 | 0053 | 3.79 | 0 |
| | NAP | | NF 667 UG/ML | 1275 | 1801 | 141.25 | 0 |
| 000067038 | NA1 | | 0073-3 PCT. | 1303 | 0047 | 3.61 | 0 |
| 000067038 | NA2 | | 0165-4 PCT. | 1350 | 0032 | 2.37 | 0 |
| 000067038 | NA3 | | 1825-5 PCT. | 1194 | 0035 | 2.93 | 0 |

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22376-2102 PROJECT 02672
EXPERIMENT 634902 DETECTOR 0000D4 SPECIES / DATE - 02/24/77

| COMPOUND | TEST | ORG ID | CONCENTRATION | POPU EP+4 | MUT1 EP+1 | MUT2 EP+1 | FREQ1 EP-5 | FREQ2 EP-5 | CONTAM |
|---|---|---|---|---|---|---|---|---|---|
| | NAN | | SOLVENT | 0633 | 0125 | 0034 | 19.75 | 5.37 | 0 |
| | NAP | | EMS 1.0 % | 0585 | 0594 | 0394 | 101.54 | 67.35 | 0 |
| 000067038 | NA1 | | 1113-4 PCT. | 0802 | 0083 | 0045 | 10.35 | 5.61 | 0 |
| 000067038 | NA2 | | 5563-5 PCT. | 0891 | 0104 | 0073 | 11.67 | 8.19 | 0 |
| 000067038 | NA3 | | 2781-6 PCT. | 0908 | 0071 | 0054 | 7.82 | 5.95 | 0 |

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22376-2102 PROJECT 02672
EXPERIMENT 633A02 DETECTOR TA100 SPECIES ICRFLO/MOUSE DATE - 02/24/77

| COMPOUND | TEST | ORG ID | CONCENTRATION | POPU EP+6 | MUTI EP+0 | FREQI EP-8 | CONTAM |
|---|---|---|---|---|---|---|---|
| | A+C | | DMN 90 UM/ML | 0201 | 0370 | 184.08 | 0 |
| | A-C | | SOLVENT | 0591 | 0417 | 70.56 | 0 |
| | ALI | | TISSUE | 0507 | 0557 | 109.86 | 0 |
| | ALU | | TISSUE | 0747 | 0585 | 78.31 | 0 |
| | ACP | LI | DMN 90 UM/ML | 0450 | 1131 | 251.33 | 0 |
| | ACP | LU | DMN 90 UM/ML | 0524 | 0494 | 94.27 | 0 |
| 000067038 | ACT | LI1 | 0073-3 PCT. | 0604 | 0444 | 73.51 | 0 |
| 000067038 | ACT | LI2 | 0365-4 PCT. | 0572 | 0329 | 57.52 | 0 |
| 000067038 | ACT | LI3 | 1825-5 PCT. | 0598 | 0302 | 50.50 | 0 |
| 000067038 | ACT | LU1 | 0073-3 PCT. | 0540 | 0411 | 76.11 | 0 |
| 000067038 | ACT | LU2 | 0365-4 PCT. | 0508 | 0413 | 81.30 | 0 |
| 000067038 | ACT | LU3 | 1825-5 PCT. | 0316 | 0316 | 100.00 | 0 |

REPORT EXP33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22376-2102 PROJECT 02672
EXPERIMENT 634108 DETECTOR TA1535 SPECIES ICRFLO/MOUSE DATE - 02/24/77

| COMPOUND | TEST | ORG ID | CONCENTRATION | POPU EP+6 | MUTI EP+0 | FREQI EP-8 | CONTAM |
|---|---|---|---|---|---|---|---|
| | A+C | | DMN 90 UM/ML | 0945 | 0047 | 4.97 | 0 |
| | A-C | | SOLVENT | 1096 | 0055 | 5.02 | 0 |
| | ALI | | TISSUE | 1049 | 0046 | 4.39 | 0 |
| | ALU | | TISSUE | 1118 | 0055 | 4.92 | 0 |
| | ACP | LI | DMN 90 UM/ML | 0421 | 0502 | 119.24 | 0 |
| | ACP | LU | DMN 90 UM/ML | 0831 | 0043 | 5.17 | 0 |
| 000067038 | ACT | LI1 | 0073-3 PCT. | 0461 | 0046 | 9.98 | 0 |
| 000067038 | ACT | LI2 | 0365-4 PCT. | 0429 | 0022 | 5.13 | 0 |
| 000067038 | ACT | LI3 | 1825-5 PCT. | 0444 | 0040 | 9.01 | 0 |
| 000067038 | ACT | LU1 | 0073-3 PCT. | 0431 | 0019 | 4.41 | 0 |
| 000067038 | ACT | LU2 | 0365-4 PCT. | 0430 | 0037 | 8.60 | 0 |
| 000067038 | ACT | LU3 | 1825-5 PCT. | 0443 | 0042 | 9.48 | 0 |

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22376-2102 PROJECT 02672
EXPERIMENT 701805 DETECTOR TA1537 SPECIES ICRFLO/MOUSE DATE - 02/24/77

| COMPOUND | TEST | ORG ID | CONCENTRATION | POPU EP+6 | MUTI EP+0 | FREQI EP-8 | CONTAM |
|---|---|---|---|---|---|---|---|
| | NAN | | SOLVENT | 0308 | 0004 | 1.30 | 0 |
| | A+C | | AMQ 333 UG/ML | 0533 | 0029 | 5.44 | 0 |
| | A-C | | SOLVENT | 0608 | 0029 | 4.77 | 0 |
| | ALT | | TISSUE | 0449 | 0021 | 4.68 | 0 |
| | ALU | | TISSUE | 0583 | 0033 | 5.66 | 0 |
| | ACP | LI | AMQ 333 UG/ML | 0466 | 0661 | 141.85 | 0 |
| | ACP | LU | AMQ 333 UG/ML | 0561 | 0040 | 7.13 | 0 |
| 000067038 | ACT | LI1 | 0073-3 PCT. | 0737 | 0049 | 6.65 | 0 |
| 000067038 | ACT | LI2 | 0365-4 PCT. | 0672 | 0033 | 4.91 | 0 |
| 000067038 | ACT | LI3 | 1825-5 PCT. | 0687 | 0024 | 3.49 | 0 |
| 000067038 | ACT | LU1 | 0073-3 PCT. | 0485 | 0027 | 5.57 | 0 |
| 000067038 | ACT | LU2 | 0365-4 PCT. | 0442 | 0037 | 8.37 | 0 |
| 000067038 | ACT | LU3 | 1825-5 PCT. | 0594 | 0022 | 3.70 | 0 |

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22376-2102 PROJECT 02672
EXPERIMENT 634106 DETECTOR TA1538 SPECIES ICRFLO/MOUSE DATE - 02/24/77

| COMPOUND | TEST | ORG ID | CONCENTRATION | POPU EP+6 | MUTI EP+0 | FREQI EP-8 | CONTAM |
|---|---|---|---|---|---|---|---|
| | A+C | | ANTH 67 UG/ML | 0716 | 0054 | 7.54 | 0 |
| | A-C | | SOLVENT | 0561 | 0061 | 10.87 | 0 |
| | ALI | | TISSUE | 0514 | 0050 | 9.73 | 0 |
| | ALU | | TISSUE | 0488 | 0049 | 10.04 | 0 |
| | ACP | LI | ANTH 67 UG/ML | 0531 | 1183 | 222.79 | 0 |
| | ACP | LU | ANTH 67 UG/ML | 0543 | 0366 | 67.40 | 0 |
| 000067038 | ACT | LI1 | 0073-3 PCT. | 0523 | 0080 | 15.30 | 0 |
| 000067038 | ACT | LI2 | 0365-4 PCT. | 0460 | 0078 | 16.96 | 0 |
| 000067038 | ACT | LI3 | 1825-5 PCT. | 0488 | 0057 | 11.68 | 0 |
| 000067038 | ACT | LU1 | 0073-3 PCT. | 0457 | 0077 | 16.85 | 0 |
| 000067038 | ACT | LU2 | 0365-4 PCT. | 0448 | 0084 | 18.75 | 0 |
| 000067038 | ACT | LU3 | 1825-5 PCT. | 0456 | 0066 | 14.47 | 0 |

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22376-2102 PROJECT 02672
EXPERIMENT 634112 DETECTOR T498 SPECIES ICRFLO/MOUSE DATE - 02/24/77

| COMPOUND | TEST | ORG ID | CONCENTRATION | POPU EP+6 | MUTI EP+0 | FREQ1 EP-8 | CONTAM |
|---|---|---|---|---|---|---|---|
| | A+C | | ANTH 67 UG/ML | 1845 | 0066 | 3.58 | 0 |
| | A-C | | SOLVENT | 1671 | 0045 | 2.69 | 0 |
| | ALI | | TISSUE | 0663 | 0054 | 8.14 | 0 |
| | ALU | | TISSUE | 0734 | 0040 | 5.45 | 0 |
| | ACP | LI | ANTH 67 UG/ML | 0970 | 0621 | 64.02 | 0 |
| | ACP | LU | ANTH 67 UG/ML | 1387 | 0135 | 9.73 | 0 |
| 000067038 | ACT | LI1 | 0073-3 PCT. | 0795 | 0066 | 8.30 | 0 |
| 000067038 | ACT | LI2 | 0365-4 PCT. | 0687 | 0056 | 8.15 | 0 |
| 000067038 | ACT | LI3 | 1825-5 PCT. | 0712 | 0059 | 8.29 | 2 |
| 000067038 | ACT | LU1 | 0073-3 PCT. | 0710 | 0057 | 8.03 | 2 |
| 000067038 | ACT | LU2 | 0365-4 PCT. | 0706 | 0069 | 9.77 | 0 |
| 000067038 | ACT | LU3 | 1825-5 PCT. | 0800 | 0051 | 6.38 | 0 |

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22376-2102 PROJECT 02672
EXPERIMENT 634805 DETECTOR 000004 SPECIES ICRFLO/MOUSE DATE - 02/24/77

| COMPOUND | TEST | ORG ID | CONCENTRATION | POPU EP+4 | MUT1 EP+1 | MUT2 EP+1 | FREQ1 EP-5 | FREQ2 EP-5 | CONTAM |
|---|---|---|---|---|---|---|---|---|---|
| | A+C | | DMN 90 UM/ML | 0748 | 0105 | 0084 | 14.04 | 11.23 | 0 |
| | A-C | | SOLVENT | 0578 | 0098 | 0079 | 16.96 | 13.67 | 0 |
| | ALI | | TISSUE | 0650 | 0128 | 0084 | 19.69 | 12.92 | 0 |
| | ALU | | TISSUE | 0593 | 0119 | 0091 | 20.41 | 15.61 | 0 |
| | ACP | LI | DMN 90 UM/ML | 0386 | 0295 | 0297 | 76.42 | 76.94 | 0 |
| | ACP | LU | DMN 90 UM/ML | 0681 | 0125 | 0075 | 18.36 | 11.01 | 0 |
| 000067038 | ACT | LI1 | 1113-4 PCT. | 0742 | 0096 | 0036 | 12.94 | 4.85 | 0 |
| 000067038 | ACT | LI2 | 5563-5 PCT. | 0600 | 0080 | 0046 | 13.33 | 7.67 | 0 |
| 000067038 | ACT | LI3 | 2781-6 PCT. | 0663 | 0076 | 0053 | 11.46 | 7.99 | 0 |
| 000067038 | ACT | LU1 | 1113-4 PCT. | 0841 | 0065 | 0044 | 7.73 | 5.23 | 0 |
| 000067038 | ACT | LU2 | 5563-5 PCT. | 0657 | 0077 | 0059 | 11.72 | 8.98 | 0 |
| 000067038 | ACT | LU3 | 2781-6 PCT. | 0681 | 0087 | 0055 | 12.78 | 8.08 | 0 |

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22376-2102 PROJECT 02672
EXPERIMENT 634206 DETECTOR TA1537 SPECIES SPRDAW/RAT DATE - 02/24/77

| COMPOUND | TEST | ORG ID | CONCENTRATION | POPU EP+6 | MUTI EP+0 | FREQ1 EP-8 | CONTAM |
|---|---|---|---|---|---|---|---|
| | A+C | | AMQ 333 UG/ML | 1460 | 0055 | 3.77 | 0 |
| | A-C | | SOLVENT | 1438 | 0023 | 1.60 | 0 |
| | ALI | | TISSUE | 1075 | 0022 | 2.05 | 0 |
| | ALU | | TISSUE | 1157 | 0033 | 2.85 | 0 |
| | ACP | LI | AMQ 333 UG/ML | 0382 | 0340 | 89.01 | 0 |
| | ACP | LU | AMQ 333 UG/ML | 1248 | 0102 | 8.17 | 0 |
| 000067038 | ACT | LI1 | 0073-3 PCT. | 0661 | 0025 | 3.78 | 0 |
| 000067038 | ACT | LI2 | 0365-4 PCT. | 0801 | 0022 | 2.75 | 0 |
| 000067038 | ACT | LI3 | 1825-5 PCT. | 0500 | 0028 | 5.60 | 0 |
| 000067038 | ACT | LU1 | 0073-3 PCT. | 1113 | 0041 | 3.68 | 0 |
| 000067038 | ACT | LU2 | 0365-4 PCT. | 1158 | 0031 | 2.68 | 0 |
| 000067038 | ACT | LU3 | 1825-5 PCT. | 0947 | 0023 | 2.43 | 0 |

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22376-2102 PROJECT 02672
EXPERIMENT 634208 DETECTOR TA100 SPECIES SPRDAW/RAT DATE - 02/24/77

| COMPOUND | TEST | ORG ID | CONCENTRATION | POPU EP+6 | MUTI EP+0 | FREQI EP-8 | CONTAM |
|---|---|---|---|---|---|---|---|
| | A+C | | DMN 90 UM/ML | 0441 | 0710 | 161.00 | 0 |
| | A-C | | SOLVENT | 0644 | 0828 | 128.57 | 0 |
| | ALI | | TISSUE | 0643 | 0825 | 128.30 | 0 |
| | ALU | | TISSUE | 0717 | 0800 | 111.58 | 0 |
| | ACP | LI | DMN 90 UM/ML | 0365 | 0635 | 173.97 | 0 |
| | ACP | LU | DMN 90 UM/ML | 0581 | 0651 | 112.05 | 0 |
| 000067038 | ACT | LI1 | 0073-3 PCT. | 0593 | 0588 | 99.16 | 0 |
| 000067038 | ACT | LI2 | 0365-4 PCT. | 0527 | 0453 | 85.96 | 0 |
| 000067038 | ACT | LI3 | 1825-5 PCT. | 0404 | 0424 | 104.95 | 0 |
| 000067038 | ACT | LU1 | 0073-3 PCT. | 0471 | 0496 | 105.31 | 0 |
| 000067038 | ACT | LU2 | 0365-4 PCT. | 0468 | 0469 | 100.21 | 0 |
| 000067038 | ACT | LU3 | 1825-5 PCT. | 0593 | 0565 | 95.28 | 0 |

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22376-2102 PROJECT 02672
EXPERIMENT 703901 DETECTOR TA1535 SPECIES SPRDAW/RAT DATE - 02/24/77

| COMPOUND | TEST | ORG ID | CONCENTRATION | POPU EP+6 | MUTI EP+0 | FREQI EP-8 | CONTAM |
|---|---|---|---|---|---|---|---|
| | A+C | | DMN 90 UM/ML | 0343 | 0024 | 7.00 | 0 |
| | A-C | | SOLVENT | 0180 | 0014 | 7.78 | 0 |
| | ALI | | TISSUE | 0527 | 0014 | 2.66 | 0 |
| | ALU | | TISSUE | 0545 | 0021 | 3.85 | 0 |
| | ACP | LI | DMN 90 UM/ML | 0422 | 0585 | 138.63 | 0 |
| | ACP | LU | DMN 90 UM/ML | 0472 | 0021 | 4.45 | 0 |
| 000067038 | ACT | LI1 | 0073-3 PCT. | 0210 | 0018 | 8.57 | 0 |
| 000067038 | ACT | LI2 | 0365-4 PCT. | 0578 | 0031 | 5.36 | 0 |
| 000067038 | ACT | LI3 | 1825-5 PCT. | 0843 | 0032 | 3.80 | 0 |
| 000067038 | ACT | LUI | 0073-3 PCT. | 0324 | 0019 | 5.86 | 0 |
| 000067038 | ACT | LU2 | 0365-4 PCT. | 0732 | 0031 | 4.23 | 0 |
| 000067038 | ACT | LU3 | 1825-5 PCT. | 1096 | 0027 | 2.46 | 0 |

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22376-2102 PROJECT 02672
EXPERIMENT 635201 DETECTOR TA1538 SPECIES SPRDAW/RAT DATE - 02/24/77

| COMPOUND | TEST | ORG ID | CONCENTRATION | POPU EP*6 | MUTI EP*8 | FREQI EP-8 | CONTAM |
|---|---|---|---|---|---|---|---|
| | A*C | | ANTH 67 UG/ML | 0528 | 0243 | 46.02 | 0 |
| | A-C | | SOLVENT | 0587 | 0058 | 9.88 | 0 |
| | ALI | | TISSUE | 0539 | 0073 | 13.54 | 0 |
| | ALU | | TISSUE | 0626 | 0077 | 12.30 | 0 |
| | ACP | LI | ANTH 67 UG/ML | 0515 | 0662 | 128.54 | 0 |
| | ACP | LU | ANTH 67 UG/ML | 0488 | 0159 | 32.58 | 0 |
| 000067038 | ACT | LI1 | 0073-3 PCT. | 0487 | 0063 | 12.94 | 0 |
| 000067038 | ACT | LI2 | 0365-4 PCT. | 0550 | 0073 | 13.27 | 0 |
| 000067038 | ACT | LI3 | 1825-5 PCT. | 0530 | 0086 | 16.23 | 0 |
| 000067038 | ACT | LU1 | 0073-3 PCT. | 0532 | 0082 | 15.41 | 0 |
| 000067038 | ACT | LU2 | 0365-4 PCT. | 0561 | 0084 | 14.97 | 0 |
| 000067038 | ACT | LU3 | 1825-5 PCT. | 0544 | 0096 | 17.65 | 0 |

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 72376-2102 PROJECT 02672
EXPERIMENT 634207 DETECTOR TA98 SPECIES SPRDAW/RAT DATE - 02/24/77

| COMPOUND | TEST | ORG ID | CONCENTRATION | POPU EP•6 | MUTI EP•0 | FREQI EP-8 | CONTAM |
|---|---|---|---|---|---|---|---|
| | A•C | | ANTH 67 UG/ML | 1729 | 0046 | 2.66 | 0 |
| | A-C | | SOLVENT | 0973 | 0062 | 6.37 | 0 |
| | ALI | | TISSUE | 0360 | 0081 | 22.50 | 0 |
| | ALU | | TISSUE | 0643 | 0062 | 9.64 | 0 |
| | ACP | LI | ANTH 67 UG/ML | 0227 | 0680 | 299.56 | 0 |
| | ACP | LU | ANTH 67 UG/ML | 0728 | 0359 | 49.31 | 0 |
| 000067038 | ACT | LI1 | 0073-3 PCT. | 0646 | 0062 | 9.60 | 0 |
| 000067038 | ACT | LI2 | 0365-4 PCT. | 0542 | 0055 | 10.15 | 0 |
| 000067038 | ACT | LI3 | 1825-5 PCT. | 0570 | 0057 | 10.00 | 0 |
| 000067038 | ACT | LU1 | 0073-3 PCT. | 0565 | 0057 | 10.09 | 0 |
| 000067038 | ACT | LU2 | 0365-4 PCT. | 0626 | 0058 | 9.27 | 0 |
| 000067038 | ACT | LU3 | 1825-5 PCT. | 0533 | 0059 | 11.07 | 0 |

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22376-2102 PROJECT 02672
EXPERIMENT 634205 DETECTOR 000004 SPECIES SPRDAW/RAT DATE - 02/24/77

| COMPOUND | TEST | ORG ID | CONCENTRATION | POPU EP+4 | MUT1 EP+1 | MUT2 EP+1 | FREQ1 EP-5 | FREQ2 EP-5 | CONTAM |
|---|---|---|---|---|---|---|---|---|---|
| | A+C | | DMN 90 UM/ML | 0638 | 0087 | 0065 | 13.64 | 10.19 | 0 |
| | A-C | | SOLVENT | 0550 | 0088 | 0061 | 16.00 | 11.09 | 0 |
| | ALI | | TISSUE | 0677 | 0128 | 0063 | 18.91 | 9.31 | 0 |
| | ALU | | TISSUE | 0646 | 0110 | 0056 | 17.03 | 8.67 | 0 |
| | ACP | LI | DMN 90 UM/ML | 0442 | 0429 | 0320 | 97.06 | 72.40 | 0 |
| | ACP | LU | DMN 90 UM/ML | 0601 | 0061 | 0019 | 10.15 | 3.16 | 0 |
| 000067038 | ACT | LI1 | 1113-4 PCT. | 0637 | 0095 | 0044 | 14.91 | 6.91 | 0 |
| 000067038 | ACT | LI2 | 5563-5 PCT. | 0621 | 0092 | 0061 | 14.81 | 9.82 | 0 |
| 000067038 | ACT | LI3 | 2781-6 PCT. | 0835 | 0074 | 0049 | 8.86 | 5.87 | 0 |
| 000067038 | ACT | LU1 | 1113-4 PCT. | 0709 | 0086 | 0052 | 12.13 | 7.33 | 0 |
| 000067038 | ACT | LU2 | 5563-5 PCT. | 0633 | 0082 | 0071 | 12.95 | 11.22 | 0 |
| 000067038 | ACT | LU3 | 2781-6 PCT. | 0619 | 0078 | 0064 | 12.60 | 10.34 | 0 |

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
COMPOUND SUMMARY BACKUP DETAIL

EXPERIMENT 634209 CONTRACT 22376-2102 DETECTOR TA100 PROJECT 02672 SPECIES RHESUS/MONKEY DATE - 02/24/77

| COMPOUND | TEST | ORG ID | CONCENTRATION | POPU EP+6 | MUTI EP+0 | FREQI EP-8 | CONTAM |
|---|---|---|---|---|---|---|---|
| | A+C | | DMN 90 UM/ML | 0336 | 0179 | 53.27 | 0 |
| | A-C | | SOLVENT | 0468 | 0268 | 57.26 | 0 |
| | ALI | | TISSUE | 0485 | 0400 | 82.47 | 0 |
| | ALU | | TISSUE | 0436 | 0318 | 72.94 | 0 |
| | ACP | LI | DMN 90 UM/ML | 0350 | 0683 | 195.14 | 0 |
| | ACP | LU | DMN 90 UM/ML | 0306 | 0312 | 101.96 | 0 |
| 000067038 | ACT | LI1 | 0073-3 PCT. | 0294 | 0378 | 128.57 | 0 |
| 000067038 | ACT | LI2 | 0365-4 PCT. | 0301 | 0305 | 101.33 | 0 |
| 000067038 | ACT | LI3 | 1825-5 PCT. | 0424 | 0307 | 72.41 | 0 |
| 000067038 | ACT | LU1 | 0073-3 PCT. | 0490 | 0289 | 58.98 | 0 |
| 000067038 | ACT | LU2 | 0365-4 PCT. | 0673 | 0276 | 41.01 | 0 |
| 000067038 | ACT | LU3 | 1825-5 PCT. | 0212 | 0302 | 142.45 | 0 |

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22376-2102 PROJECT 02672
EXPERIMENT 634902 DETECTOR TA1535 SPECIES RHESUS/MONKEY DATE - 02/24/77

| COMPOUND | TEST | ORG ID | CONCENTRATION | POPU EP+6 | MUTI EP+0 | FREQI EP-8 | CONTAM |
|---|---|---|---|---|---|---|---|
| | A+C | | DMN 90 UM/ML | 0854 | 0022 | 2.58 | 0 |
| | A-C | | SOLVENT | 0905 | 0020 | 2.21 | 0 |
| | ALI | | TISSUE | 1003 | 0034 | 3.39 | 0 |
| | ALU | | TISSUE | 0792 | 0022 | 2.78 | 0 |
| | ACP | LI | DMN 90 UM/ML | 0760 | 0279 | 36.71 | 0 |
| | ACP | LU | DMN 90 UM/ML | 0930 | 0022 | 2.37 | 0 |
| 000067038 | ACT | LI1 | 0073-3 PCT. | 1318 | 0023 | 1.75 | 0 |
| 000067038 | ACT | LI2 | 0365-4 PCT. | 0959 | 0028 | 2.92 | 0 |
| 000067038 | ACT | LI3 | 1825-5 PCT. | 1288 | 0036 | 2.80 | 0 |
| 000067038 | ACT | LU1 | 0073-3 PCT. | 1084 | 0026 | 2.40 | 0 |
| 000067038 | ACT | LU2 | 0365-4 PCT. | 1290 | 0026 | 2.02 | 0 |
| 000067038 | ACT | LU3 | 1825-5 PCT. | 1089 | 0024 | 2.20 | 0 |

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22376-2102 PROJECT 02672
EXPERIMENT 634210 DETECTOR TA1537 SPECIES RHESUS/MONKEY DATE - 02/24/77

| COMPOUND | TEST | ORG ID | CONCENTRATION | POPU EP*6 | MUTI EP*8 | FREQI EP-8 | CONTAM |
|---|---|---|---|---|---|---|---|
| | A+C | | AMQ 333 UG/ML | 2044 | 0050 | 2.45 | 0 |
| | A-C | | SOLVENT | 1436 | 0035 | 2.44 | 0 |
| | ALI | | TISSUE | 1784 | 0037 | 2.07 | 0 |
| | ALU | | TISSUE | 2176 | 0024 | 1.10 | 0 |
| | ACP | LI | AMQ 333 UG/ML | 0454 | 0370 | 81.50 | 0 |
| | ACP | LU | AMQ 333 UG/ML | 1803 | 0084 | 4.66 | 0 |
| 000067038 | ACT | LI1 | 0073-3 PCT. | 1772 | 0027 | 1.52 | 0 |
| 000067038 | ACT | LI2 | 0365-4 PCT. | 1410 | 0020 | 1.42 | 0 |
| 000067038 | ACT | LI3 | 1825-5 PCT. | 1328 | 0024 | 1.81 | 0 |
| 000067038 | ACT | LU1 | 0073-3 PCT. | 1738 | 0032 | 1.84 | 0 |
| 000067038 | ACT | LU2 | 0365-4 PCT. | 1600 | 0034 | 2.13 | 0 |
| 000067038 | ACT | LU3 | 1825-5 PCT. | 1914 | 0029 | 1.52 | 0 |

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22376-2102 PROJECT 02672
EXPERIMENT 635102 DETECTOR TA1538 SPECIES RHESUS/MONKEY DATE - 02/24/77

| COMPOUND | TEST | ORG ID | CONCENTRATION | POPU EP+6 | MUTI EP+0 | FREQI EP-8 | CONTAM |
|---|---|---|---|---|---|---|---|
| | A+C | | ANTH 67 UG/ML | 0501 | 0049 | 9.78 | 0 |
| | A-C | | SOLVENT | 0549 | 0076 | 13.84 | 0 |
| | ALI | | TISSUE | 0602 | 0074 | 12.29 | 0 |
| | ALU | | TISSUE | 0569 | 0068 | 11.95 | 0 |
| | ACP | LI | ANTH 67 UG/ML | 0529 | 0725 | 137.05 | 0 |
| | ACP | LU | ANTH 67 UG/ML | 0493 | 0076 | 15.42 | 0 |
| 000067038 | ACT | LI1 | 0073-3 PCT. | 0462 | 0064 | 13.85 | 0 |
| 000067038 | ACT | LI2 | 0365-4 PCT. | 0462 | 0052 | 11.26 | 0 |
| 000067038 | ACT | LI3 | 1825-5 PCT. | 0473 | 0071 | 15.01 | 0 |
| 000067038 | ACT | LU1 | 0073-3 PCT. | 0514 | 0063 | 12.26 | 0 |
| 000067038 | ACT | LU2 | 0365-4 PCT. | 0439 | 0066 | 15.03 | 0 |
| 000067038 | ACT | LU3 | 1825-5 PCT. | 0441 | 0056 | 12.70 | 0 |

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22376-2102 PROJECT 02672
EXPERIMENT 634302 DETECTOR TA98 SPECIES RHESUS/MONKEY DATE - 02/24/77

| COMPOUND | TEST | ORG ID | CONCENTRATION | POPU EP*6 | MUTI EP*0 | FREQI EP-8 | CONTAM |
|---|---|---|---|---|---|---|---|
| | A*C | | ANTH 67 UG/ML | 2229 | 0129 | 5.79 | 0 |
| | A-C | | SOLVENT | 1691 | 0093 | 5.50 | 0 |
| | ALI | | TISSUE | 0973 | 0093 | 9.56 | 0 |
| | ALU | | TISSUE | 1355 | 0144 | 10.63 | 0 |
| | ACP | LI | ANTH 67 UG/ML | 1137 | 1402 | 123.31 | 0 |
| | ACP | LU | ANTH 67 UG/ML | 1308 | 0228 | 17.43 | 0 |
| 000067038 | ACT | LI1 | 0073-3 PCT. | 1302 | 0153 | 11.75 | 0 |
| 000067038 | ACT | LI2 | 0365-4 PCT. | 1168 | 0139 | 11.90 | 0 |
| 000067038 | ACT | LI3 | 1825-5 PCT. | 1301 | 0171 | 13.14 | 0 |
| 000067038 | ACT | LU1 | 0073-3 PCT. | 1597 | 0117 | 7.33 | 0 |
| 000067038 | ACT | LU2 | 0365-4 PCT. | 1510 | 0154 | 10.20 | 0 |
| 000067038 | ACT | LU3 | 1825-5 PCT. | 1491 | 0142 | 9.52 | 0 |

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22376-2102 PROJECT 02672
EXPERIMENT 701806 DETECTOR 000004 SPECIES RHESUS/MONKEY DATE - 02/24/77

| COMPOUND | TEST | ORG ID | CONCENTRATION | POPU EP+4 | MUT1 EP+1 | MUT2 EP+1 | FREQ1 EP-5 | FREQ2 EP-5 | CONTAM |
|---|---|---|---|---|---|---|---|---|---|
| | NAN | | SOLVENT | 0357 | 0101 | 0000 | 28.29 | 0.00 | 0 |
| | A+C | | DMN 90 UM/ML | 0742 | 0144 | 0079 | 19.41 | 10.65 | 0 |
| | A-C | | SOLVENT | 0790 | 0146 | 0075 | 18.48 | 9.49 | 0 |
| | ALI | | TISSUE | 0770 | 0127 | 0084 | 16.49 | 10.91 | 0 |
| | ALU | | TISSUE | 0698 | 0107 | 0071 | 15.33 | 10.17 | 0 |
| | ACP | LI | DMN 90 UM/ML | 0414 | 0387 | 0304 | 93.48 | 73.43 | 0 |
| | ACP | LU | DMN 90 UM/ML | 0387 | 0100 | 0066 | 25.84 | 17.05 | 0 |
| 000067038 | ACT | LI1 | 1113-4 PCT. | 0699 | 0116 | 0069 | 16.60 | 9.87 | 0 |
| 000067038 | ACT | LI2 | 5563-5 PCT. | 0731 | 0102 | 0077 | 13.95 | 10.53 | 0 |
| 000067038 | ACT | LI3 | 2781-6 PCT. | 0616 | 0132 | 0060 | 21.43 | 9.74 | 0 |
| 000067038 | ACT | LU1 | 1113-4 PCT. | 0680 | 0115 | 0091 | 16.91 | 13.38 | 0 |
| 000067038 | ACT | LU2 | 5563-5 PCT. | 0626 | 0148 | 0072 | 23.64 | 11.50 | 0 |
| 000067038 | ACT | LU3 | 2781-6 PCT. | 0599 | 0123 | 0060 | 20.53 | 10.02 | 0 |